

Facial Trustworthiness Influences Age Differences in Visual Attention Toward Credible Versus Non-credible Messages

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Decision Editor: Jennifer Tehan Stanley, PhD, FGSA

Abstract

Background and Objectives: The literature on consumer decision-making and aging suggests that older adults make less optimal buying decisions than younger adults do, partly because older adults tend to perceive salespersons' faces as more trustworthy. This study aims to directly test the difference in the effect of perceived facial trustworthiness on buying intention between younger and older adults. It also aims to reveal the underlying mechanisms of this age-related difference by testing whether a more trustworthy face disrupts older adults' attention toward credible (vs. non-credible) information to a higher degree compared with younger adults.

Research Design and Methods: A sample of 92 younger (aged 18–37 years) and 83 older (aged 60–82 years) adults viewed advertisements for 32 products while their eye movements were captured by an eye tracker to measure their fixation duration (as an indicator of attention). The advertisements varied in terms of the *credibility* of the content and the *trustworthiness* of the salesperson's face.

Results: Both age groups showed higher buying intentions for products featured in advertisements with higher credibility and facial trustworthiness. When facial trustworthiness was lower, both age groups showed greater attentional preferences for credible over non-credible content. However, this distinction in attention disappeared in older but not younger adults with an increase in facial trustworthiness.

Discussion and Implications: Our findings suggest that although facial trustworthiness generally increases buying intention of both younger and older adults, it only reduces older (but not younger) adults' attentional discrimination between credible and non-credible content. This paper offers a novel and promising mechanism for the increase in fraud vulnerability in late adulthood.

Translational Significance: Research has suggested that older adults make less optimal buying decisions than younger adults do, and the age differences in perception of facial trustworthiness may contribute to this phenomenon. Using an eye-tracking paradigm, we tracked participants' attention when they were viewing advertisements. We found that when the salespersons' faces were more trustworthy, the attentional discrimination between credible and non-credible advertisement contents diminished in older adults but remained unaffected in younger adults. Although existing fraud-prevention interventions for older adults usually focus on improving their accuracy in judging facial trustworthiness, our findings suggest that attention allocation should also be targeted.

Keywords: Buying decision, Central cues, Credibility, Eye tracking, Peripheral cues

Aging has often been associated with an increased tendency to make suboptimal buying decisions. For example, older adults are more likely to fall victim to fraud compared with younger adults (Shao et al., 2019). Such age difference may be partially explained by older adults' tendency to perceive unfamiliar faces as more trustworthy than younger adults do (Chen et al., 2022). Research has documented the impact of perceived facial trustworthiness on partner preferences (South Palomares & Young, 2018) and the evaluation of legal evidence and defendant culpability (Porter et al., 2010). However, to our knowledge, no study has yet directly examined whether perceiving salespersons' faces as more trustworthy has down-

stream consequences on the buying intention of younger and older adults. This study aims to fill this gap. Moreover, this study examines whether facial trustworthiness affects younger and older adults' attention allocation to credible versus non-credible content in advertisements. Using an eye-tracking paradigm, we examined the visual attention of younger and older adults to different elements (e.g., product description, and testimonial) of credible and non-credible advertisements in a hypothetical setting resembling browsing static advertisements in real life. Although we expected both age groups to pay more attention to credible content than non-credible content, we tested whether facial trustworthiness reduces such

Received: December 21 2022; Editorial Decision Date: May 8 2023.

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attentional discrimination more significantly among older than younger adults.

Dual-Process Framework in Decision and Judgment

Many dual-process models of decision-making and judgment formation propose that there are multiple pathways involved in processing a piece of information (Evans & Stanovich, 2013). The elaboration likelihood model (ELM; Petty et al., 2009) posits that people process information in two different routes, including a central and a peripheral route. When people take the central route, they focus on central cues pertinent to the merits of the message itself. In the context of advertisements, central information may include the properties, functions, and quality of products. When people take the peripheral route, they pay more attention to peripheral cues, which include everything that is not describing the product itself, such as surrounding images, product spokespersons, slogans, and colors. Although peripheral cues usually do not convey the necessary information for decision-making, older adults are more likely to be persuaded by peripheral cues than younger adults (Liao & Fu, 2014; Yoon et al., 2005).

Age Differences in Perception of Facial Trustworthiness

Among peripheral cues, facial trustworthiness has been relatively well-studied. Whether a face is trustworthy is one of the most fundamental social judgments that people automatically make (Oosterhof & Todorov, 2008). Existing literature suggests that older adults generally perceive unfamiliar faces as more trustworthy compared with younger adults (e.g., Chen et al., 2022; Zebrowitz et al., 2017; but see Petrican et al., 2013; Pehlivanoglu et al., 2023 for different findings). For example, Cassidy et al. (2019) found that while younger and older adults generally agreed on which faces were trustworthy or not, older adults demonstrated a trust bias and were more likely to classify a face as trustworthy. Specifically, age differences in facial trust ratings are only significant for faces with more cues to untrustworthiness and not for faces with more trust cues (Castle et al., 2012). Such age differences in facial trustworthiness perception may be explained by older adults' diminished awareness and response to untrustworthiness cues. Indeed, when older adults were instructed to deliberately process negative cues or given more time for browsing, age differences in perceived facial trustworthiness diminished or disappeared (Chen et al., 2022; Lu et al., 2021).

Two theoretical perspectives have been proposed to explain why older adults report higher perceived facial trustworthiness than younger adults. From a motivational perspective, older adults show cognitive preferences for positive over negative information, which is known as the age-related positivity effect (Reed & Carstensen, 2012). As the cues of trustworthiness tend to be perceived as more positive than the cues of untrustworthiness, older adults may show greater cognitive preferences for the former than the latter. From a cognitive perspective, the age-related declines in cognitive functioning may hinder older adults' ability to process untrustworthy faces thoroughly. For instance, when viewing untrustworthy faces, older adults, relative to younger adults, tend to show reduced activation in the insula, an area related to "gut feelings" and risk perception (Castle et al., 2012). Both perspectives have

received support from empirical studies (Petrican et al., 2013; Zebrowitz et al., 2017).

Age Differences in the Effects of Facial Trustworthiness on Decisions

Although facial trustworthiness is typically considered a peripheral cue, research shows that it can substantially affect people's decisions across a variety of contexts, from hypothetical economic trust games (Jaeger et al., 2019; van't Wout & Sanfey, 2008) to real-life behaviors, such as juridic (Porter et al., 2010) and voting decisions (Little et al., 2012). There are mixed findings as to whether such decisions are more influenced by facial trustworthiness among older than younger adults. Some studies suggest that older adults are indeed more susceptible to the influence of facial trustworthiness. For example, in economic trust games, older adults tend to rely more on players' facial trustworthiness, instead of their actual behaviors (e.g., cheating), when evaluating their character (Suzuki, 2018). In contrast, some studies suggest that younger and older adults are equally affected by facial trustworthiness. For example, Bell et al. (2013) showed that enhancement in the perceived trustworthiness of players' faces increased younger and older adults' investment in a trust game to the same degree. These studies mainly focused on decisions in trust games, and little is known about whether facial trustworthiness differentially affects buying decisions in younger and older adults.

Age Differences in the Effects of Facial Trustworthiness on Attention

In addition, there is a research gap in understanding how facial trustworthiness affects information processing in younger and older adults. To our best knowledge, there is only one study that has investigated age differences in attention allocation toward trustworthy and untrustworthy faces (Petrican et al., 2013). In that study, participants saw a face looking in different directions. Then, a letter appeared either on the left or the right sides of the face. Participants needed to press a key to indicate the location of the letter, and their reaction time was measured. There was a greater cueing effect (i.e., shorter reaction time) among older (but not younger) adults when the cue (i.e., the gaze direction of the face) was provided by a trustworthy face than when it was provided by an untrustworthy face. This result suggests that older adults tend to allocate more attention to information linked to trustworthy faces than information linked to untrustworthy faces. However, attention was not directly measured but inferred based on subsequent reaction time in that study. To address this issue, we directly measured participants' attention using the eye-tracking technique in the current study. Moreover, we used more complex experimental stimuli (i.e., advertisements), allowing us to examine how facial trustworthiness affects younger and older adults' attention when there are multiple cues, including both central and peripheral cues.

Current Study

As reviewed above, the literature suggests that older adults may perceive unfamiliar faces as more trustworthy than younger adults do (e.g., Chen et al., 2022), which may partially explain why older adults make more suboptimal buying

decisions (Castle et al., 2012; Chen et al., 2022). Little research has yet been conducted to directly examine whether perceiving a face (e.g., the face of a salesperson) as trustworthy may amplify decision-making biases among older adults. Indirect evidence from research on economic trust games suggests that it does (Suzuki, 2018), but the findings have been mixed (Bell et al., 2013). Moreover, the underlying cognitive mechanism of such age differences is not well understood. Previous studies on information processing only investigated whether trustworthy faces attract more attention than untrustworthy faces (Petrican et al., 2013). However, no study has yet tested whether trustworthy faces disrupt attention allocation to information that is more helpful for decision-making. This study aims to address this gap. Using eye-tracking techniques, we captured participants' eye movements to measure their attention allocation when they were viewing advertisements in a setting that resembled browsing static advertisements in daily life. The advertisements consisted of a product description (central cue), a testimonial of the product (central cue), and the face of a salesperson (peripheral cue). The testimonial content and providers' affiliation were utilized to manipulate credibility. The face of the salesperson also varied in trustworthiness. Although the gain-loss framing effect (Tversky & Kahneman, 1981) was beyond the scope of the present study, we counterbalanced gain and loss framings in the product descriptions of the advertisements to control for the potential framing effects (e.g., see Best & Charness, 2015 for a meta-analysis). Participants indicated their buying intention for the product after viewing each advertisement. We hypothesized that while higher facial trustworthiness would contribute to higher buying intentions, the buying intentions of older adults would be more strongly affected by facial trustworthiness compared with younger adults. Moreover, we hypothesized that while both age groups would show attentional preference in the form of longer fixation time for credible over non-credible information, older adults' attention would be affected by peripheral facial trustworthiness more so than younger adults. The pre-registration report of the study is available on Open Science Framework (https://osf.io/743zj/?view_only=e3f6d42052e8454c9af42f57bd717af4). The study has been approved by the Survey and Behavioral Research Ethics Committee at The Chinese University of Hong Kong.

Method

Participants

To detect a small effect size f of 0.1 for a 2 (age group; between-subject) \times 2 (credibility of the product; within-subject) \times 2 (facial trustworthiness of the salesperson; within-subject) interaction in a repeated measure ANOVA with a statistical power (i.e., $1-\beta$) of 0.8 at the level of $\alpha = 0.05$, a sample of 140 participants in total were needed according to G*Power 3.1 (Faul et al., 2009). The framing style (gain- vs. loss-framing) of the product description was a covariate to be controlled for and thus was not considered in the power analysis. We recruited 118 younger (aged 18–37 years) and 146 older (aged 60–82 years) community-dwelling adults through our university subject pool, lab database, and university mass mailing. Younger adults recruited from the subject pool were remunerated with two-course credits. Younger and older adults recruited from the university mass mailing and lab database were compensated with HK\$80 (about

\$10 USD) and HK\$150 (about \$19 USD), respectively. All participants had normal or correct-to-normal visual acuity. No participant had received eye surgery, had eye-movement or alignment abnormalities, or wore multifocal glasses or contact lenses. Among these participants, two older adults were excluded from data analysis due to illiteracy and lack of attention to all stimuli. The full sample consisted of 118 younger adults (age $M = 19.91$, $SD = 3.71$) and 144 older adults (age $M = 68.22$, $SD = 5.46$). Some participants were further excluded from the eye-tracking analyses due to invalid eye data (see the results section for more information). We used the full sample for all analyses except those involving eye-tracking variables.

Apparatus and Materials

Eye tracker

We used Applied Science Laboratory (ASL) Eye-Trac6 D6 Desk Mounted Optics remote eye tracker (ASL, USA) to track participants' eye movements when they were viewing advertisements. Participants sat 24 inches in front of a computer monitor with a resolution of 1440 px \times 900 px (480 mm \times 300 mm). The eye tracker recorded participants' eye fixation duration and location at a sampling rate of 120 Hz. We calibrated the eye tracker to participants' left eyes with the 9-point standard calibration mode.

Stimuli and manipulation

Advertisements.—

Each advertisement consisted of (1) the face of a salesperson, (2) a product description, (3) a product picture, (4) a testimonial, and (5) the last name and title of the testimonial provider (see Figure 1). Each advertisement was written in one of the combinations of credibility of the product testimonial (credible vs. non-credible), facial trustworthiness of the salesperson (trustworthy vs. untrustworthy), and framing of the description (gain vs. loss framing), such that there were four advertisements for each product (framing of the description was treated as a covariate that was counterbalanced across advertisements). Before the formal experiment, we conducted a pilot study to validate and select faces and texts for the advertisements. The manipulations of the trustworthiness of salespersons' faces, framing of descriptions, and credibility of testimonials were all successful. The pilot test results are shown in Supplementary Material.

Face (trustworthy vs. untrustworthy).—

We generated 120 faces (32 faces were eventually selected through pilot testing as shown in Supplementary Material) using FaceGen Modeller 3.18 (Singular Inversions Inc., Canada) with the following criteria: (1) East Asian, (2) 20% of AU25 Lip Parted, (3) 20% of Expression SmileClosed, (4) 60% of Expression SmileOpen, (5) 40% of Modifier Eyes Wide, and (6) 30% of Expression Surprise. We set these criteria to ensure that our stimuli were suitable in the context of Hong Kong and resembled advertisement models' facial expressions in real life. We had an equal number of male and female faces. The hairstyle of each gender was kept consistent. We had an equal number of faces that were younger (below age 30), middle-aged (between age 31 and 49), and older (over age 50). We selected and randomly applied 11 skin textures to make these faces more realistic.

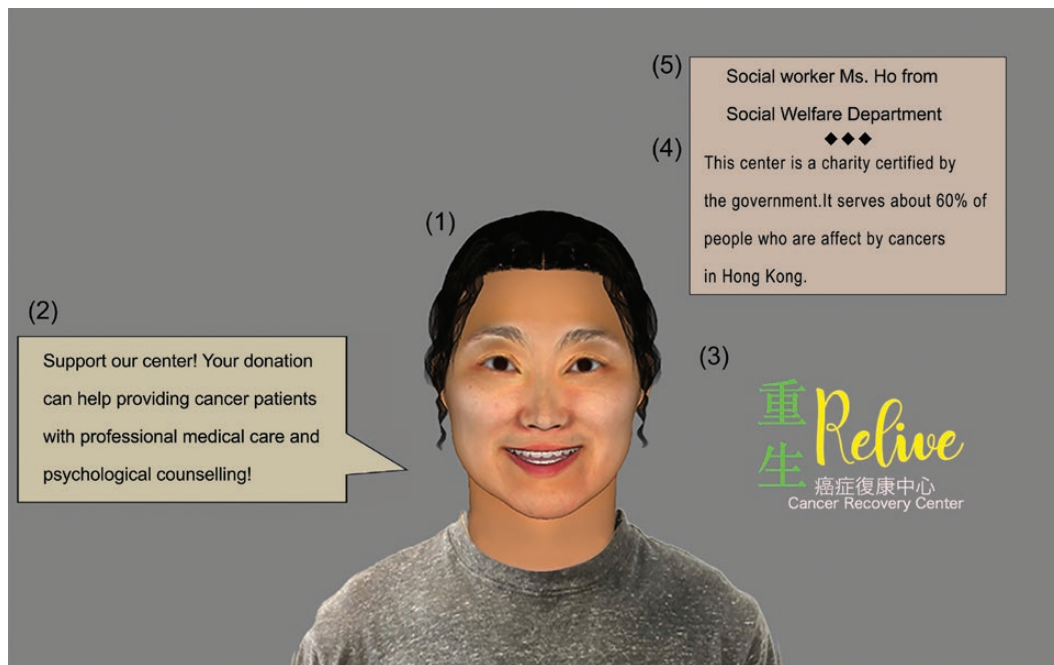


Figure 1. A sample advertisement. *Notes:* This sample advertisement has a trustworthy face, a gain-framed description, and a credible testimonial. In the advertisement task, each advertisement consisted of (1) the face of a salesperson (either trustworthy or untrustworthy); (2) a description that provided basic information or facts about the product (either gain-framed or loss-framed); (3) a picture of the product; (4) a testimonial about the product; and (5) the testimonial provider's name and title (the testimonial and provider were either credible or non-credible). The salesperson was always placed at the center of the advertisement. The description was placed on one side, while the testimonial and the picture of the product were placed on the other side of the advertisement. The location of the description and that of the testimonial/picture of the product were counterbalanced across trials. The advertisements used in the experiment were written in Chinese.

Product.—

We included 80 products from real scams to compose advertisements (32 products and their advertisements were eventually selected through pilot testing as shown in [Supplementary Material](#)). Products were categorized into four domains, including charity services, health-related products, financial products, and entertainment products. For each of the products, we created two descriptions (a gain-framing version and a loss-framing version) and two testimonials (a credible version and a non-credible version) and counterbalanced them in the presentation across participants.

Description (gain vs. loss framing).

A description provided basic information or facts about a product. Each description contained 25–30 Chinese characters. A product's description could be either gain- or loss-framed ([Rothman & Salovey, 1997](#)). The gain-framed descriptions highlighted the benefits of getting the products (e.g., *By getting ____, you can get [advantages]/avoid [disadvantages]*). The loss-framed descriptions highlighted the downsides of not getting the products (e.g., *By not getting ____, you can get [disadvantages]/you miss [advantages]*).

Testimonial (credible vs. non-credible).—

A testimonial included the provider's last name, title, and comment on a product. Each testimonial contained 25–30 Chinese characters. As the perceived credibility of a message (e.g., the review of a product) could be influenced by both the message itself and its source (e.g., the reviewer; [Foy et al., 2017](#); [Russo et al., 1981](#)), we manipulated the credibility of both testimonials and their providers. For the credible

testimonials, providers were more qualified to evaluate the products, testimonial contents were more objective, factual, and verifiable, and the texts contain no grammatical mistakes. For the non-credible testimonials, providers were individuals who are unqualified to evaluate the products, testimonial contents were more subjective, unverifiable, and irrelevant, and the texts contain some typos and grammatical mistakes. Because the purpose of advertisements was to promote these products, all testimonials in our created advertisements were positive about the target products. Our instructions explicitly stated that the testimonials were part of the advertisements. Thus, the testimonial providers' credibility reflects the credibility of the product.

Measures

Attention

We defined a fixation within one degree of the visual angle of a location for at least 100 ms as a gaze. For each advertisement shown on the monitor screen, we defined five areas of interest (AOIs) for the face, product picture, description, testimonial, and testimonial provider, respectively. The focus of this study is on the face, the description, and the testimonial. We calculated a ratio score of fixation duration to assess the attention preference for each focused AOI (face, description, or testimonial) relative to the remaining AOIs ([Isaacowitz et al., 2006](#)).

Advertisement-related questions

After viewing all advertisements, participants were asked to rate the extent to which the advertisements were difficult to understand (from 1 = *very difficult* to 5 = *very easy*) and

realistic (from 1 = *very unrealistic* to 5 = *very realistic*) in general. They were also asked to indicate how frequently they encounter advertisements about charity, health, entertainment, and financial products in daily life (from 1 = *very rarely* to 5 = *very frequently*) and how important these domains of products were to them (from 1 = *not important* to 5 = *very important*).

Potential covariates

Participants reported their demographic information, including age, sex, education (“Please indicate your highest education qualification obtained”), household income (“What is your monthly household income?”), relationship status (“What is your current relationship status?”), and years of living in Hong Kong (“How long have you been living in Hong Kong? Please state the number of years”). Participants also reported their subjective health (“How do you feel about your current health subjectively?”) on a 5-point scale (1 = *very bad*, 5 = *very good*). These variables (except for age) were included as covariates in the statistical analysis.

The advertising skepticism questionnaire (Tian & Pasadeos, 2012) was used to measure how skeptical participants felt toward advertisements in general (e.g., “We can depend on getting the truth in most advertising”; 1 = *strongly disagree*, 5 = *strongly agree*). The propensity to trust scale (Frazier et al., 2013) was used to assess participants’ general tendency to trust a person (e.g., “My tendency to trust others is high”; 1 = *strongly disagree*, 5 = *strongly agree*). The abbreviated impulsiveness scale (Coutlee et al., 2014) was used to measure participants’ impulsiveness (e.g., “I act on the spur of the moment”; 1 = *almost never/never*, 4 = *almost always/always*). Participants also reported whether they had fallen victim to any scams (0 = *no*, 1 = *yes*). These measures were included as potential covariates because they had been found in prior literature to influence participants’ attitudes toward products and buying intentions (e.g., Hernandez et al., 2019; Martin & Potts, 2009).

Using the affect valuation index (AVI; Tsai et al., 2006), we measured how frequently participants experienced (actual effect) and wanted to feel (ideal effect) an array of emotions (e.g., enthusiastic, unhappy) in the past week (1 = *never*, 5 = *always*). These affect measures were included as covariates to control for the potential effects of emotion on decision-making (Bandyopadhyay et al., 2013).

We also measured personality traits using items from the GSOEP Big Five Inventory (Gerlitz & Schupp, 2005). This scale covers five facets of personality, including openness to experience (e.g., “has an active imagination”), conscientiousness (e.g., “does a thorough job”), extraversion (e.g., “is talkative”), agreeableness (e.g., “is considerate and is kind to almost everyone”), and neuroticism (e.g., “worries a lot”; 1 = *completely not applicable to me*, 7 = *completely applicable to me*). Personality traits were controlled for as covariates because previous research suggested that personality traits could influence people’s decision-making (El Othman et al., 2020).

Moreover, since previous research also suggested that cognitive resources might play a role in the perception of facial trustworthiness (Zebrowitz et al., 2017), we controlled for participants’ cognitive functioning measured using two tests—the Animal Naming (verbal fluency) Test (Sager et al., 2006) and the Digit Symbol Substitution Test (Wechsler, 1958).

Procedures

Before the individual session began, participants gave informed consent and completed two visual acuity tests—the Snellen Chart (Boslaugh, 2008) and Pelli-Robson Contrast Sensitivity Chart (Pelli et al., 1988). Participants who passed these two tests (to ensure normal or corrected-to-normal visual acuity) were invited to continue in the study. This study consisted of a practice session and a formal experimental session. During the practice session, the experimenter introduced the components (i.e., product picture, product description, testimonial, information about the testimonial provider, picture of a salesperson) of a sample advertisement and the experimental procedures to participants. Then, participants went through some practice trials until they became familiar with the procedures. The practice trials were not included in the formal experiment.

At the beginning of the formal experimental session, we first calibrated the eye tracker to the participants’ left eyes. Participants then completed 32 advertisement-browsing trials while their eye movements were tracked. In each trial, a fixation cross showed at the center of the screen for 3 s, followed by the display of an advertisement for 20 s. Participants were instructed to watch the advertisement freely and, after it disappeared, indicate their likelihood of buying the product featured in the advertisement (0 = *very unlikely*, 10 = *very likely*), assuming that the product was available, and affordability was not an issue.

After completing the formal experimental session, participants filled out a questionnaire regarding their perceptions of the advertisements they saw during the experiment, their prior experiences with scams, personality traits, and demographic information. Participants also completed the cognitive functioning measures. Last, they were debriefed and compensated for their participation.

Analyses Plan

As products and participants were mutually embedded within each other and thereby constituted a two-level data structure, we used the *lme4* package (Bates et al., 2015) in R studio (v3.6.1) to conduct hierarchical linear modeling (HLM) analyses to examine the effects of age group (younger adults = 0, older adults = 1), credibility (of the product testimonial; non-credible = 0, credible = 1), and trustworthiness (of the salesperson; untrustworthy = 0, trustworthy = 1) on buying intention and attention. Framing (loss framing = 0, gain framing = 1) was statistically controlled for as a covariate. The random intercepts across participants and across products were included in the models.

Results

Data Cleaning and Preliminary Analyses

Three younger and three older adults encountered technical errors and had no eye data recorded. To ensure the quality of the eye data, we discarded trials with (1) no fixation, (2) less than 40% of gaze being tracked, and (3) the percentage of fixation duration outside of AOIs higher than 80%. After the initial data cleaning, participants who had fewer than 50% of the trials being retained were excluded from the dataset. In total, 5,000 trials from 92 younger adults (age $M = 19.96$, $SD = 3.97$; 30.4% male) and 83 older adults (age $M = 68.2$, $SD = 5.12$; 30.1% male) were retained in the data set. The

retention rates for younger and older adults were 78.0% and 57.9%, respectively, $\chi^2 = 11.18, p < .001$. There was no age difference between retained and removed participants within each age group (for the younger age group: $t = -0.34, p = .74$; for the older age group: $t = 0.01, p = .99$). Participants' sex was not associated with the removal/retention of their data ($\chi^2 = 3.34, p = .07$). Among the retained participants, 600 trials of eye data (10.7%) were discarded. The discard rates did not significantly vary across experimental conditions ($\chi^2 = 2.84, p = .90$) or age groups ($\chi^2 = 0.76, p = .38$). The removed data were missing at random.

The demographic information, ratings of the advertisements, and measures of personality traits of all the participants are shown in Table 1. Participants reported the advertisements as highly readable ($M = 3.83, SD = 0.78$) and not significantly deviant from the advertisements in daily life ($M = 3.11, SD = 0.93$). Among these potential covariates, conscientiousness, education, year of living in Hong Kong, income, relationship status, and performance on digit symbol substitution task significantly correlated with at least one attention measure and differed between age groups. They thereby were treated as covariates in the following analyses on attention. Relationship status, advertisement skepticism, advertisement realness, and domain importance were significantly correlated with buying intention and differed between age groups. They thereby were treated as covariates in the following analyses on buying intention. The inclusion of covariates did not change the results reported below unless specified.

Buying Intention

The descriptive statistics of buying intention by age groups and conditions are shown in Table 2. The main effects of age group ($b = -0.33, p = .049$), testimonial credibility ($b = 0.61, p < .001$), facial trustworthiness ($b = 0.01, p = .04$) and framing ($b = 0.33, p < .001$) on buying intention were significant. Younger adults ($M = 5.08, SD = 2.69$) indicated higher buying intentions than older adults ($M = 4.75, SD = 2.86$). Participants showed higher buying intention when the advertisements were more credible ($M = 5.20, SD = 2.74$; non-credible: $M = 4.59, SD = 2.80$), trustworthy ($M = 4.95, SD = 2.77$; not trustworthy: $M = 4.84, SD = 2.80$), and gain-framed ($M = 5.06, SD = 2.82$; loss-framed: $M = 4.73, SD = 2.75$). The age group \times trustworthiness \times credibility interaction and all two-way interactions on buying intention were not significant ($p > .10$). After including the covariates, the main effect of facial trustworthiness became marginally significant ($b = 0.09, p = .056$) while the patterns of the other effects remained the same.

Attention to Testimonial

The descriptive statistics of the percentage of fixation duration on each area of interest by age groups are shown in Table 3. The main effect of testimonial credibility on attention to testimonials was significant. In general, participants paid more attention to credible than non-credible testimonials ($b = 0.03, p < .001$). The main effects of facial trustworthiness ($b = -0.003, p = .59$) and age group ($b = 0.04, p = .10$) were not significant. The age group \times trustworthiness \times credibility interaction effect on attention to testimonials was significant ($b = -0.05, p = .03$). Follow-up analyses showed that the age group \times credibility interaction was significant when the faces were trustworthy ($b = 0.07, p < .001$), but not when the faces were untrustworthy ($b = -0.009, p = .60$). When faces were

trustworthy, younger adults ($b = 0.06, p < .001$), but not older adults ($b = -0.01, p = .37$), paid more attention to credible than non-credible testimonials (Figure 2). Further analyses revealed that older adults' attention to credible testimonials decreased ($b = -0.03, p = .04$) while their attention to non-credible testimonials remained unchanged ($b = 0.01, p = .36$) with the increase in facial trustworthiness.

Attention to Product Description

The main effect of testimonial credibility on attention to product description was significant. Participants paid more attention to the product descriptions when testimonials were non-credible (vs. credible; $b = -0.04, p < .001$). We interpreted this finding as follows: when a central cue (the testimonial) was non-credible, individuals moved their attention away from it and toward the other available central cue (the product description). The main effect of the age group was significant, which was manifested as older adults paying more attention to the product descriptions compared with younger adults ($b = 0.15, p < .001$). The age \times credibility \times trustworthiness interaction effect on attention to product description was significant ($b = 0.10, p = .047$). Follow-up analyses showed that the age group \times credibility interaction was significant when the faces were trustworthy ($b = 0.09, p = .01$), but not when the faces were untrustworthy ($b = -0.02, p = .72$). When faces were trustworthy, younger adults ($b = -0.08, p < .001$), but not older adults ($b = 0.01, p = .72$), paid more attention to the product descriptions when the testimonial was non-credible than when it was credible (Figure 3).

Attention to Salesperson's Face

The main effect of the age group on attention to salesperson's faces was significant, where older adults paid less attention to the faces compared with younger adults ($b = -0.12, p < .001$). The main effects of trustworthiness ($b = -0.005, p = .45$) and credibility ($b = -0.001, p = .90$) were not significant. The three-way interaction effect of age \times credibility \times trustworthiness and all two-way interactions were not significant.

Discussion

The literature on aging and trust suggests that older adults tend to perceive unfamiliar faces as more trustworthy than younger adults do (Castle, et al., 2012; Chen, et al, 2022). Some have argued that this phenomenon is partly responsible for an age-related increase in buying decisions that are less optimal (Shao et al., 2019). Applying eye-tracking techniques and a novel experimental design, the current study directly examined whether older adults' attention and buying attention were more influenced by facial trustworthiness.

Contrary to our hypothesis, older adults did not show higher intentions to buy a product when the salesperson's face in the advertisement was more trustworthy when compared to younger adults. Rather, both age groups were more likely to indicate higher intentions to buy a product when the face was trustworthy than when it was untrustworthy, and when the product's testimonial appeared to be credible than when it appeared to be non-credible.

Both age groups paid more attention to credible testimonials than non-credible ones, and both age groups paid more attention to the description of a product when the product's testimonial was non-credible. Because the product description and testimonial were the only two central cues available

Table 1. Demographic Information of Participants

Variable	α	All participants				Participants with eye data			
		Younger adults (<i>n</i> = 118)		Older adults (<i>n</i> = 144)		Younger adults (<i>n</i> = 92)		Older adults (<i>n</i> = 83)	
		Mean (<i>N</i>)	<i>SD</i> (%)	Mean (<i>N</i>)	<i>SD</i> (%)	Mean (<i>N</i>)	<i>SD</i> (%)	Mean (<i>N</i>)	<i>SD</i> (%)
Age ^a	—	19.91	3.71	68.22	5.46	19.96	3.97	68.22	5.12
Sex (Female)	—	76	64.4	96	66.7	64	69.6	58	69.9
Education ^a									
Below primary school	—	0	0.0	12	8.3	0	0.0	5	6.0
Primary school	—	0	0.0	32	22.2	0	0.0	18	21.7
Secondary school	—	2	1.7	73	50.7	2	2.2	50	60.2
Tertiary school	—	108	91.5	23	16.0	84	91.3	9	10.8
Master's degree	—	5	4.2	4	2.8	4	4.3	1	1.2
Doctoral degree	—	3	2.5	0	0.0	2	2.2	0	0.0
Relation status ^a									
Single	—	87	73.7	24	16.7	68	73.9	11	13.3
Married	—	3	2.5	93	64.6	3	3.3	55	66.3
In a relationship	—	28	23.7	0	0.0	21	22.8	0	0.0
Divorced/separated	—	0	0.0	7	4.9	0	0.0	5	6.0
Widowed	—	0	0.0	20	13.9	0	0.0	12	14.5
Income ^a									
\$0–\$3,000	—	3	2.5	33	22.9	2	2.2	20	24.1
\$3,001–\$8,500	—	3	2.5	35	24.3	1	1.1	19	22.9
\$8,501–\$14,000	—	10	8.5	17	11.8	10	10.9	7	8.4
\$14,001–\$20,000	—	9	7.6	19	13.2	4	4.3	12	14.5
\$20,001–\$29,999	—	18	15.3	18	12.5	13	14.1	13	15.7
\$30,000–\$59,999	—	46	39.0	16	11.1	38	41.3	8	9.6
\$60,000–\$99,999	—	16	13.6	4	2.8	12	13.0	3	3.6
>\$100,000	—	13	11.0	2	1.4	12	13.0	1	1.2
Subjective health (1–5)	—	3.33	0.9	3.41	0.84	3.39	0.93	3.49	0.82
Years living in Hong Kong ^a	—	17.87	5.13	60.03	12.85	18.13	5.09	59.98	14.56
Fraud victim (yes)	—	47	39.8	44	30.6	35	38.0	29	34.9
DSST ^a	—	75.96	11.18	45.5	13.87	75.72	11.34	46.22	13.61
Verbal fluency ^a	—	14.98	3.45	11.39	4.01	14.77	3.24	11.55	4.29
ASQ (1–5) ^a	.70	3.57	0.49	3.31	0.43	3.58	0.46	3.33	0.45
Propensity to trust (1–5)	.82	3.30	0.85	3.23	0.72	3.28	0.86	3.22	0.78
Impulsivity (1–4)	.80	2.11	0.4	2.10	0.40	2.08	0.37	2.08	0.35
BF_O (1–7)	.70	4.18	1.13	3.97	1.22	4.14	1.13	4.03	1.16
BF_C (1–7) ^a	.62	4.31	1.04	5.12	0.92	4.43	1.00	5.13	0.92
BF_E (1–7) ^{ab}	.72 ^b	4.12	1.35	4.61	1.28	4.10	1.37	4.70	1.23
BF_A (1–7)	.38	5.16	0.89	5.13	0.87	5.13	0.90	5.13	0.92
BF_N (1–7) ^a	.62	4.68	1.05	3.96	1.09	4.61	1.10	3.93	1.12
AVI_IP (1–5)	.87	3.45	0.59	3.31	0.62	3.49	0.57	3.35	0.61
AVI_IN (1–5)	.82	1.68	0.54	1.79	0.46	1.65	0.50	1.78	0.41
AVI_AP (1–5) ^a	.87	2.69	0.53	3.12	0.57	2.70	0.56	3.17	0.56
AVI_AN (1–5) ^a	.85	2.35	0.63	1.89	0.44	2.34	0.62	1.81	0.35
Ads realness (1–5) ^a	—	2.93	0.98	3.17	0.80	3.00	1.01	3.23	0.83
Ads readability (1–5)	—	3.86	0.83	3.76	0.78	3.91	0.75	3.73	0.81

Notes: Numbers inside the brackets indicate the score range of each measurement; Income referred to monthly household income and was measured in Hong Kong dollars. A = agreeableness; AN = actual negative affect; AP = actual positive affect; ASQ = advertisement skepticism questionnaire; AVI = affective valuation index; BF = GSOEP Big Five inventory; C = conscientiousness; DSST = digit symbol substitution task; E = extraversion; IN = ideal negative affect; IP = ideal positive affect; N = neuroticism; O = openness to experience.

^aAge differences are significant in the full sample.

^bStatistics were based on two items. The internal consistency measure was the correlation between the two items.

in our study, gazing more at the product description means paying less attention to the testimonial. These results suggested that both age groups showed attentional preferences toward central information in advertisements that were more credible and away from non-credible information. Yet, older

adults showed the above attentional preferences only when the salesperson's face was less trustworthy. When the face was more trustworthy, older adults paid equal attention to credible and non-credible central information. Further analyses suggested that this phenomenon was driven by decreased attention toward credible central information with increased facial trustworthiness. Facial trustworthiness did not moderate younger adults' attentional preferences. Taken together, these findings suggest that older adults tend to lose attentional discrimination between credible and non-credible central information in the presence of alluring peripheral cues (in this case, trustworthy faces), which may explain why older adults are more likely to make suboptimal buying decisions and fall victim to fraud (e.g., Chen, 2002; Shao et al., 2019) in comparison with younger adults.

Our results suggest that older adults' tendency to perceive unfamiliar faces as more trustworthy may not necessarily influence their intentions to buy products from untrustworthy salespeople. However, older adults may be prone to fraudulent advertisements at a more subtle level. Higher facial trustworthiness reduces older adults' tendency to pay more attention to credible information and away from non-credible information. The quality of the information encoded may

Table 2. Means and Standard Deviations of Buying Intention

Condition	Older adults		Younger adults		<i>p</i> Value
	Mean	<i>SD</i>	Mean	<i>SD</i>	
Credibility					
Credibility	5.03	2.86	5.42	2.56	<.001
Non-credible	4.47	2.82	4.74	2.77	<.01
Trustworthiness					
Trustworthy	4.77	2.84	5.17	2.67	<.001
Not trustworthy	4.73	2.87	4.99	2.70	<.01
Framing					
Gain	4.92	2.91	5.24	2.69	<.001
Loss	4.58	2.79	4.92	2.68	<.001

Table 3. Means and Standard Deviations of Percentage of Fixation Duration on Each Area of Interest

Area of interest	Overall (<i>N</i> = 5,000)		Older adults (<i>n</i> = 2,382)		Younger adults (<i>n</i> = 2,618)		<i>p</i> Value
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Face	9.22	12.88	6.40	11.28	11.78	13.69	<.001
Description	29.05	22.62	31.56	24.11	26.77	20.92	<.001
Testimonial	32.04	21.66	33.80	23.66	30.44	19.53	<.001
Testimonial provider	9.84	11.65	9.81	12.74	9.86	10.56	.86
Product	6.84	10.33	4.57	8.97	8.91	11.03	<.001
Outside	13.01	15.17	13.87	15.72	12.22	14.61	<.001

Note: *p* Values indicate the significance level of the age group differences.

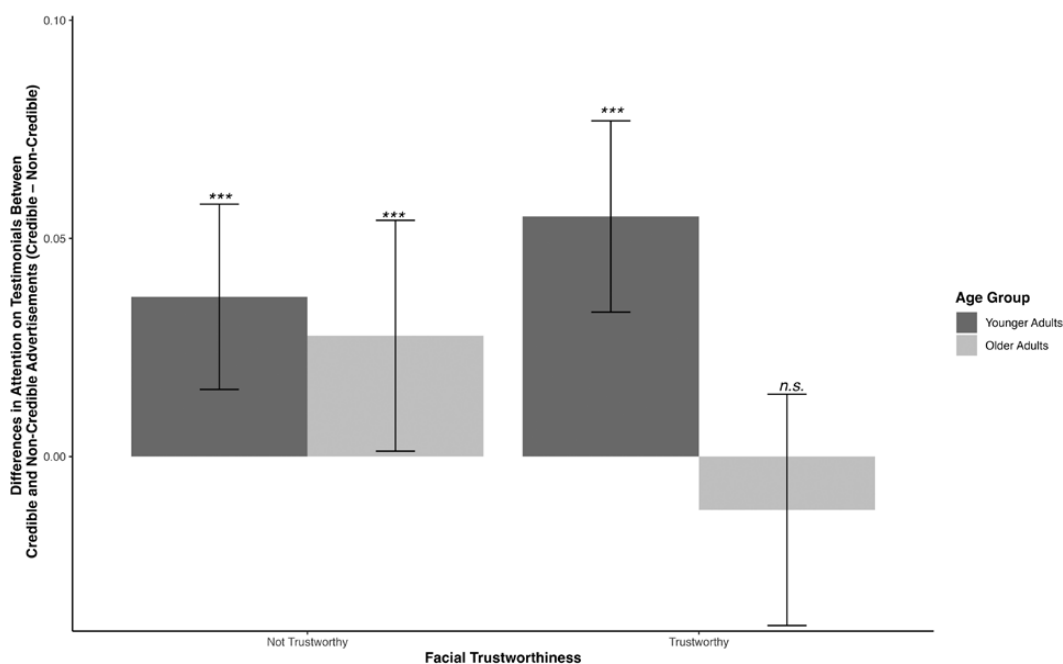


Figure 2. Mean differences in attention (credible-non-credible) on testimonials in relation to facial trustworthiness. ****p* < .001, n.s. = not significant.

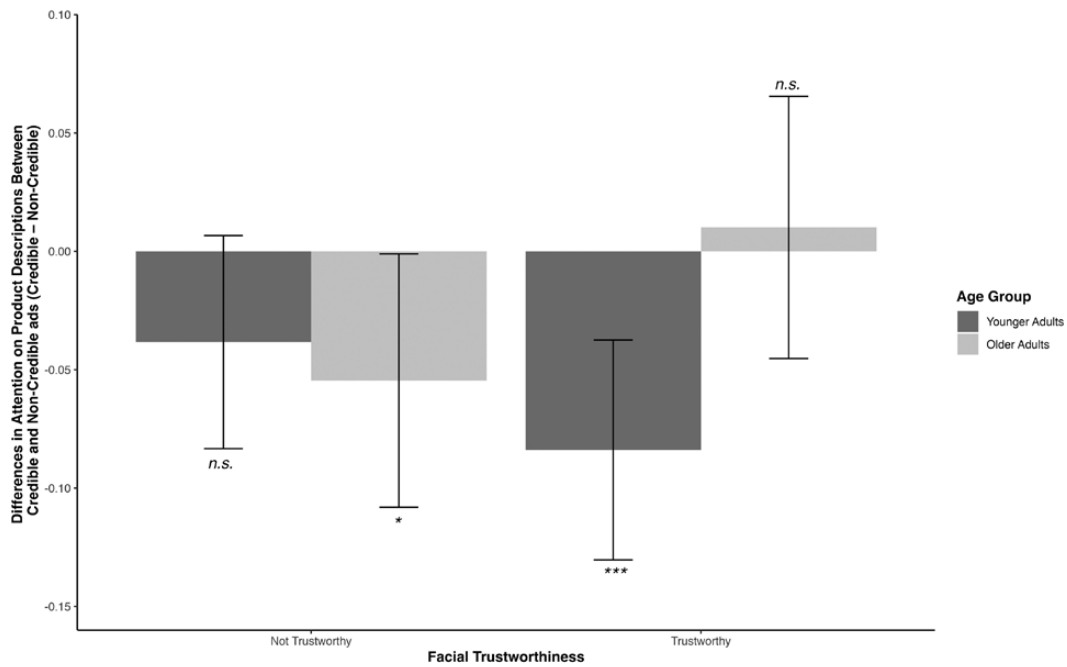


Figure 3. Mean differences in attention (credible–non-credible) on product descriptions in relation to facial trustworthiness. *** $p < .001$, * $p < .05$, n.s. = not significant.

thus be compromised, adversely affecting the quality of their ultimate decisions. Existing interventions that aim at reducing this risk for older adults usually work on increasing older adults' accuracy in perceiving facial trustworthiness (e.g., Chen, et al., 2022). Our findings demonstrate that interventions should also consider older adults' attention deployment during information processing. For instance, it may be beneficial to prompt older adults to deliberately search for and pay more attention to information that helps determine the merits of a product (i.e., central cues) even when the salesperson looks trustworthy.

These findings have implications for the literature on the heuristic-factual dual-process model. Although some studies showed that older adults were more likely to use heuristics in decision-making than younger adults (Peters et al., 2007), Xing and Isaacowitz (2011) found that older adults showed a higher attentional preference for factual over heuristic information when compared with younger adults. Xing and Isaacowitz speculated that the higher education of their older participants might have compensated for the typical age-related bias toward heuristic information. Using the same eye-tracking techniques as Xing and Isaacowitz (2011) did, our study suggests an alternative possibility: Heuristics, such as facial trustworthiness, may not bias older adults' visual attention by directly attracting attention. Instead, heuristics may reduce older adults' sensitivity to the difference in the credibility of other available information. Future studies should further explore this possibility. Perhaps, the prior literature was just using "attention" as a symbolic term to indicate that older adults' decisions and judgments were influenced more by peripheral/heuristic cues, and not that older adults literally gazed more at those cues.

There are several limitations to our study. First, it is a cross-sectional study. The observed age differences in attention may not purely reflect developmental changes but, instead, be confounded by cohort effects. Second, we only used static

advertisements in our study. Although static advertisements are still popular in the market, there are other major formats such as video streams, online live-streaming promotions, and in-person interactions. Previous studies found that the age-related positivity effect diminished when social stimuli were used compared with nonsocial stimuli (e.g., Hess et al., 2013). Therefore, the age differences in visual attention observed in this study might not be generalizable to real-life interactions or when the advertisements take a dynamic form (e.g., video). Further studies may replicate our findings using dynamic stimuli. Third, the current study focuses on how facial trustworthiness influences visual attention. Yet, buying decisions can happen in various contexts, and the advertisements may not involve a facial stimulus. Future studies should investigate age differences in processing other types of cues (e.g., the trustworthiness of voice). Fourth, there might be other potential mechanisms that affect people's buying decisions that were not measured in the current study. For instance, older adults may be less efficient in using bodily physiological responses to help identify potential problematic information and remain vigilant (Asp & Tranel, 2013) when they make buying decisions. Future studies may explore other mechanisms that affect older adults' buying decisions and information processing.

In short, the current study contributes to the literature on aging by showing that facial trustworthiness affects attentional discrimination between credible and non-credible information among older but not younger adults. This may be one key mechanism that contributes to older adults' higher susceptibility to suboptimal buying decisions and fraud. Future interventions should take older adults' attentional allocation into consideration to reduce their fraud vulnerability. In addition, our findings highlight the importance of measuring attention directly (e.g., via eye-tracking techniques), as it provides additional insights into the complex mechanisms of information processing that may not be readily inferred from behavioral measurements (e.g., reaction time).

Supplementary Material

Supplementary data are available at *Innovation in Aging* online.

Funding

The study was supported by a General Research Fund, Research Grants Council of Hong Kong (Grant No. 14612718), and a Social Science Research Impact Fund from the Faculty of Social Science, The Chinese University of Hong Kong.

Conflict of Interest

None.

Acknowledgments

We thank Minjie Lu (Beijing Normal University, Zhuhai), Nhi Ngo (our former lab member), and Dahua Wang (Beijing Normal University, Beijing) for their contributions to the development of the research idea and proposal. We thank Jennifer Lay (University of Exeter) for her contribution to the development of the experimental stimuli. We thank Isaacowitz Derek (Northeastern University) and his team for their helpful suggestions for the study design and setup of the eye-tracker. We also thank our research assistant, Verona Leung, and many student helpers for the data collection.

Data Availability

Data, materials analytic methods, and statistical codes used in this study will be available upon request. This study was preregistered (<https://osf.io/743zj>).

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